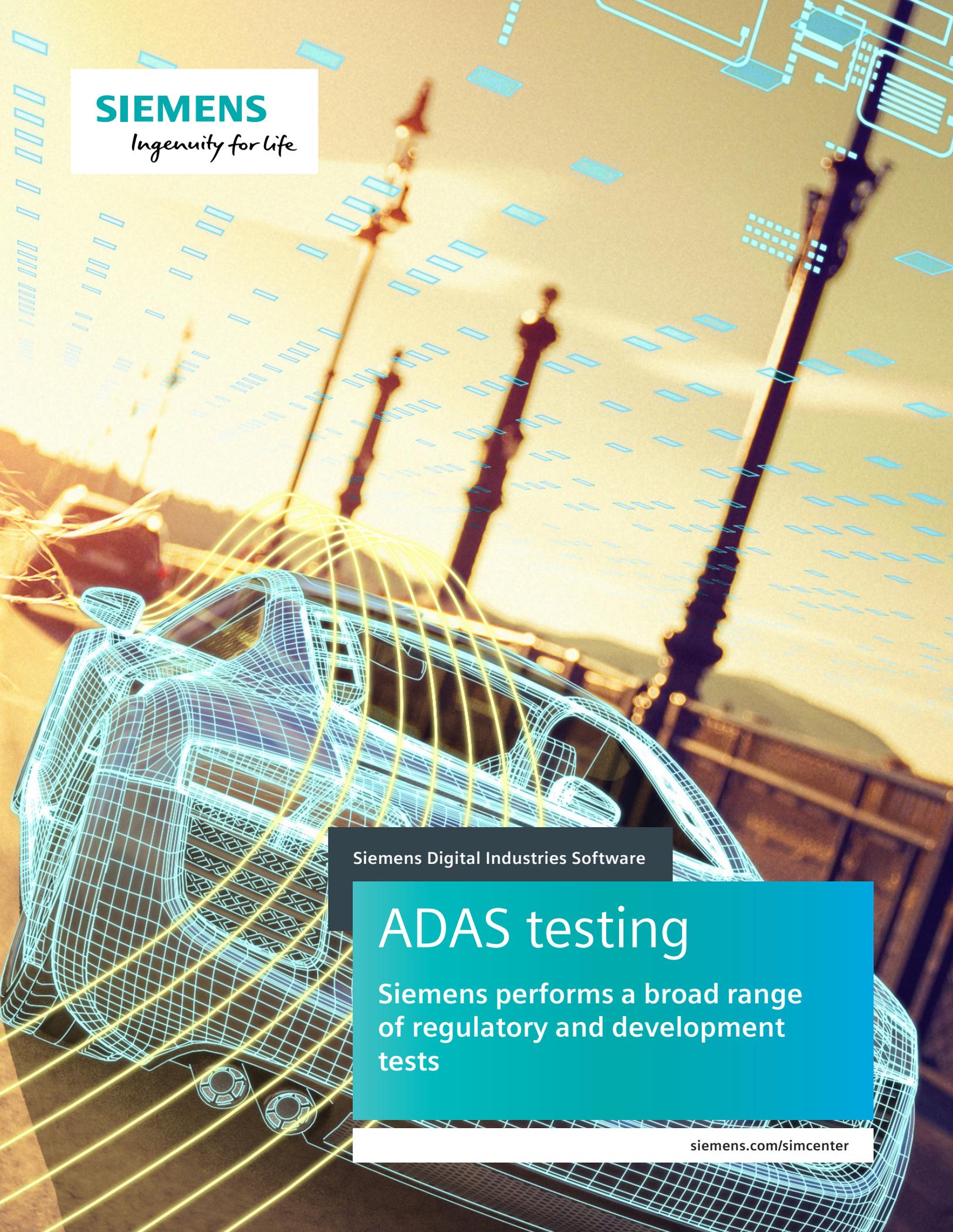




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Siemens Digital Industries Software

# ADAS testing

Siemens performs a broad range of regulatory and development tests

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# Testing according to globally recognized procedures



Siemens is fully equipped to perform all sorts of ADAS tests, from regulatory to developmental.

With more than 1 billion automotive vehicles operating worldwide and 3,287 people killed by crashes daily, vehicle safety has become more important than ever. More than 90 percent of all accidents are caused by driver error, therefore decreasing the human influence on driving can significantly reduce the number of casualties. Implementing advanced driver assistance systems (ADAS) is the first step towards achieving full autonomy (level 5), a situation in which the driver is no longer needed to operate the vehicle.

Siemens is fully equipped to perform all sorts of ADAS tests, from regulatory to developmental. Our dedicated team performs consumer tests for passenger vehicles: for example, those devised by the European New Car Assessment Program (NCAP). We are also fully equipped to perform all ADAS tests conforming to current United Nations Economic

Commission for Europe (UNECE) regulations for trucks and buses, such as ECE Regulation 130 lane departure warning system (LDWS) and ECE Regulation 131 advanced emergency braking system (AEBS). Additionally, all our ADAS activities are International Organization for Standardization (ISO) 10725 accredited.

# Benefits



- Testing according to NCAP protocols
- ADAS development tests
- Accredited by the Netherlands Vehicle Authority (RDW) to perform tests and guide vehicle certification
- ECE testing for trucks and buses
- Dedicated ADAS team
- Engineering support throughout the development process

## Euro NCAP testing

We perform tests according to Euro NCAP protocols, both for AEBS (car-to-car rear and vulnerable road users) and lane support systems (emergency lane keeping, lane keeping assist and lane departure warning). Our dedicated ADAS team can perform development tests that may require alternative specifications, from different target

offsets to diverse light conditions. For official testing we use the Euro NCAP-accredited Aldenhoven Testing Center (ATC) in Germany. This test track includes all required features, such as real road edges (RRE), dashed, solid and fully marked lanes.

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## UNECE testing

In addition to consumer testing, we are an RDW-accredited laboratory that is authorized to carry out regulatory testing for UNECE ECE-R130 (uniform provisions for the approval of motor vehicles regarding LDWS),

and ECE-R131 (uniform provisions for the approval of motor vehicles with regard to the AEBS). Both regulations concern assessment of trucks and buses.

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## Testing according to future ADAS protocols

As vehicle technology progresses, so does the need for consumer testing of the technologies. Because we are a member of Euro NCAP working groups, we are always involved in changes and therefore can offer customers ADAS tests that are compliant with future

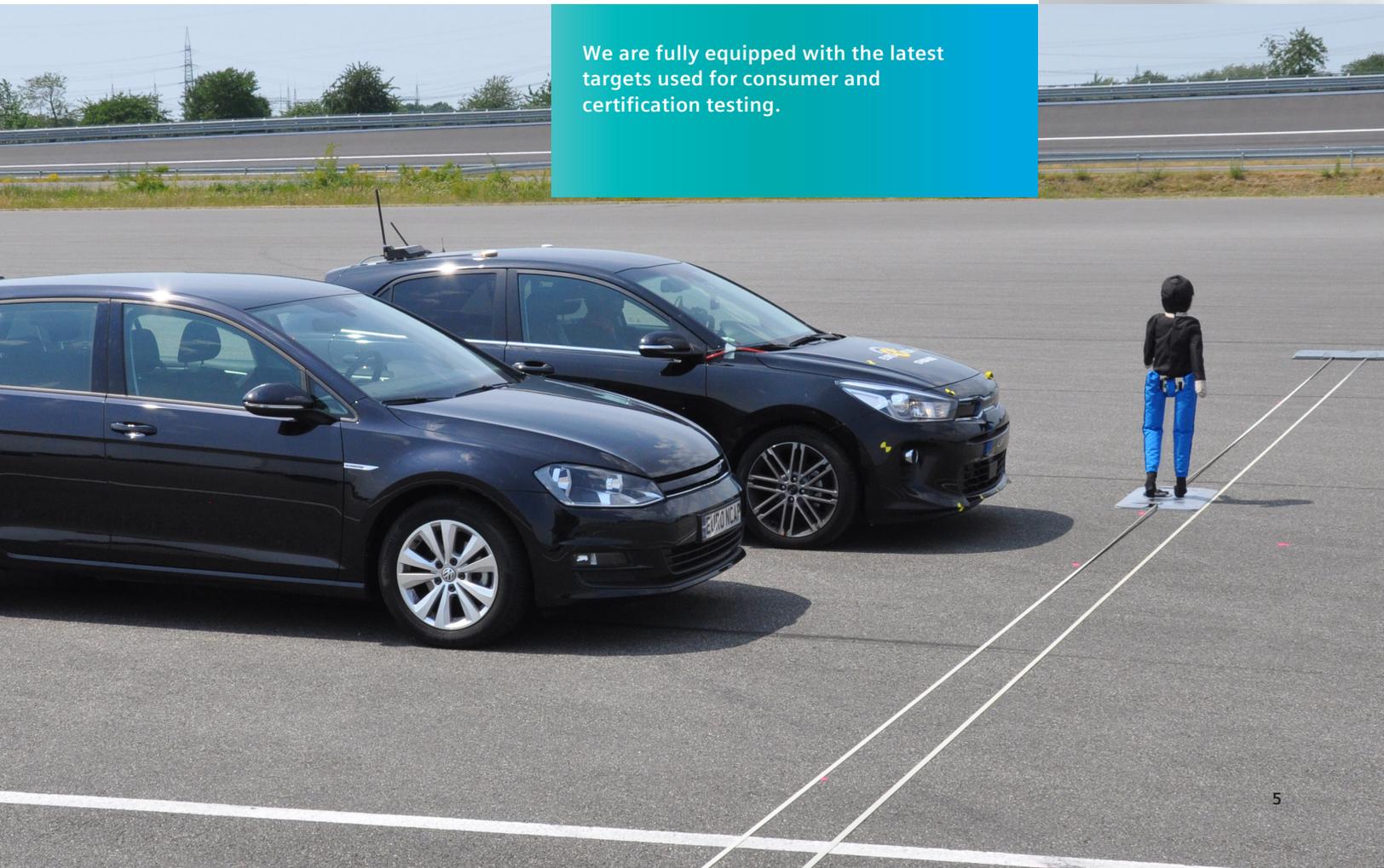
protocols. This gives customers not only the opportunity to consult us regarding future protocols, but also to test vehicles, systems and components early in the development phase when consultation can be especially helpful.

# Testing with the latest targets

We are fully equipped with the latest test targets used for consumer and certification testing. Our global vehicle target (GVT) is a controllable soft vehicle target on a self-propelled Global Positioning System (GPS) guided platform, which is accurate to 1 centimeter. Upon impact the target foam body separates into lightweight parts, avoiding damage to the vehicle under test and facilitating quick reassembly between test runs (about 10 minutes). The GVT is capable of a maximum speed of 100 kilometers per hour and contains the same radar, lidar and visual attributes of a passenger vehicle. Therefore, it will be seen as such by the vehicle under test.

We use 4 active articulated adult and child dummies as well as adult bicyclist dummies for the vulnerable road users (VRU) assessment. These dummies are designed with humanlike radar cross section, infrared and visual properties, and are capable of repeated high speed impacts and are easy to reassemble.

We are fully equipped with the latest targets used for consumer and certification testing.



# ADAS test equipment and tracks

Our ADAS team is prepared with excellent equipment for testing using Anthony Best Dynamics Combined Brake and Accelerator (CBAR), SR60 Steering Robot, SR15 Steering Robot, SPT20 Pedestrian propulsion unit, Guided Soft Target and TrackFi Vehicle-to-Vehicle (V2V) synchro. We use Oxford Technical Solutions (OxTS) 6 axis IMU RT3003 and RT3003X, OxTS DGPS Base Station and

OxTS RT Range System for GPS guidance in our test vehicles and targets. We make use of the ATC, which is an accredited Euro NCAP test track, and is compliant with all consumer testing and ECE-130 and ECE-131 regulations

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## Siemens' dedicated ADAS team

Our ADAS team consists of technical specialists that are solely dedicated to ADAS activities and work across several countries and test tracks. They are active throughout the entire year, which makes it possible to have a flexible agenda for our customers. Our test engineers perform pre-NCAP assessments, benchmark testing and official testing according to all ADAS official protocols.

Additionally, help can be provided in the early phase of development with whole vehicle, component and system development testing, both on and off the test track. Our specialists are available for consulting on test methods and scenario development.

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## Providing reliable results with ISO 17025 accreditation

Our testing facility and laboratory in Helmond, The Netherlands, is ISO 17025 accredited. This means we have implemented a quality system aimed at improving our ability to consistently produce valid results that meet the requirements for the competence of testing and

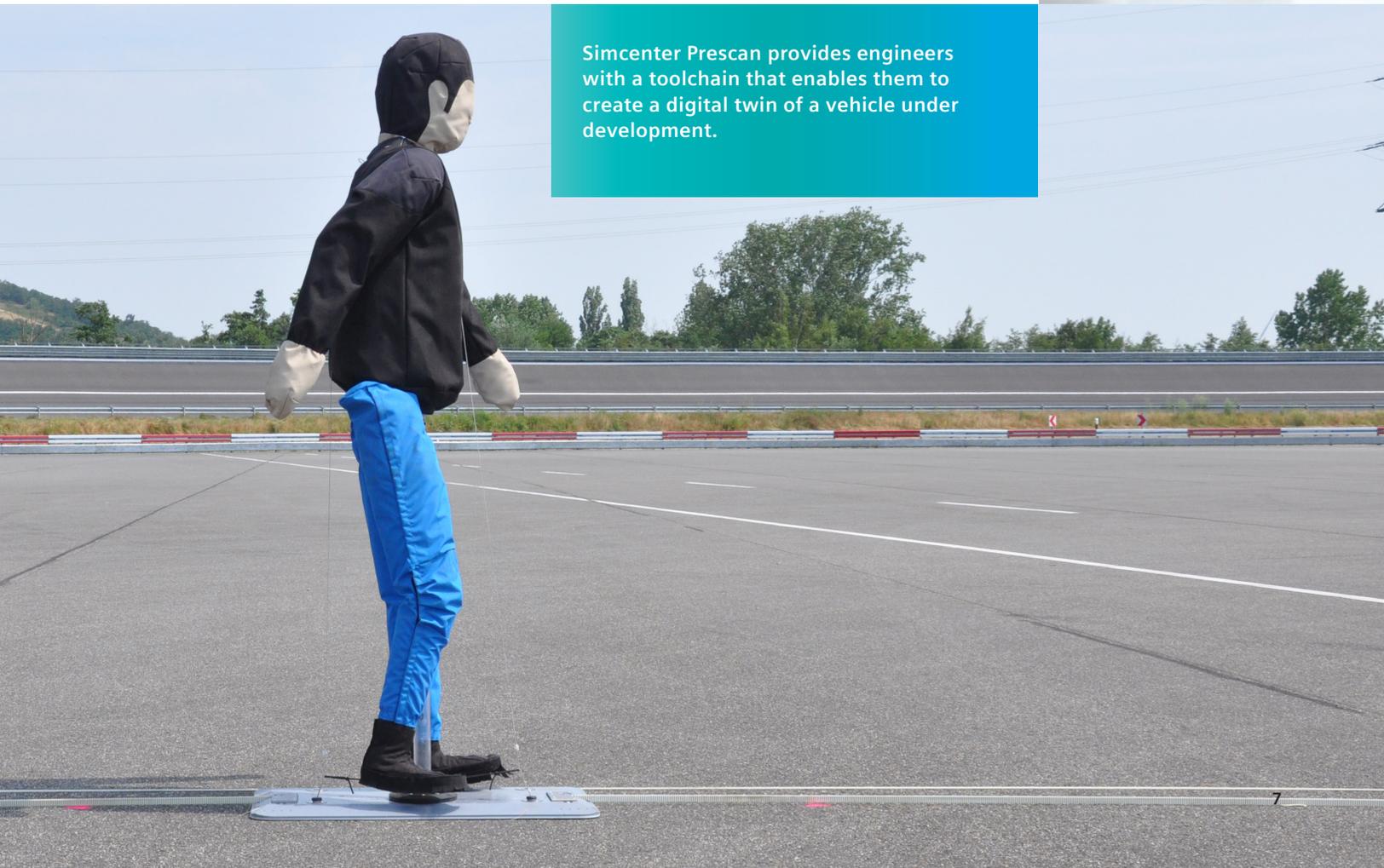
calibration laboratories. In most major countries, ISO 17025 is the standard for which most labs must hold accreditation in order to be deemed technically competent.

# From ADAS to autonomous driving

Implementing ADAS may be the first step towards autonomous driving, however, according to Toyota's president and chief executive officer (CEO), Akio Toyoda, it will take "14.2 billion kilometers of testing, including simulation," to reach full autonomy and create safe autonomous vehicles.

Simcenter Prescan™ software is a physics-based simulation platform used for developing ADAS and automated vehicle functionalities. It serves as the foundation for doing robust validation and certification of automated vehicles. It also helps customers

decrease costs and increase reliability and safety by emphasizing a systematic product development approach with short feedback loops and adaptation cycles. Simcenter Prescan provides engineers with a toolchain that enables them to create a digital twin of a vehicle under development.

A crash test dummy, dressed in a black hooded jacket and bright blue pants, stands on a small metal platform in an open, paved area. The background shows a clear sky, some trees, and a distant horizon. A blue text box is overlaid on the right side of the image.

Simcenter Prescan provides engineers with a toolchain that enables them to create a digital twin of a vehicle under development.

### **About Siemens Digital Industries Software**

Siemens Digital Industries Software, a business unit of Siemens Digital Industries, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, we work with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood. For more information on our products and services, visit [siemens.com/plm](https://www.siemens.com/plm).

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